

2)

An apparatus for automatically measuring a pH of soil at a relatively large number of places in a field, comprising:

a chassis having at least one shank extending therefrom for exposing the soil at a desired sampling depth;

Ai
a pH sensor affixed to the chassis;

at least one probe assembly affixed to the chassis, each of the at least one probe assembly comprising:

a probe telemetrically connected to the pH sensor;

a sampling platform for collecting soil from pre-selected soil depths and bringing it into contact with the probe; and

a computer telemetrically connected to the pH sensor for collecting and storing data points.

2)

An apparatus for automatically measuring a pH of soil at a relatively large number of places in a field, comprising:

a chassis, comprising:

a plurality of wheels;

at least one shank extending from the chassis for exposing the soil at a desired sampling depth; and

a tank for holding a liquid;

a pH sensor affixed to the chassis;

at least one probe assembly affixed to the chassis, each of the at least one probe assembly comprising:

a probe telemetrically connected to the pH sensor;

a sampling platform for collecting soil from pre-selected soil depths and

bringing it into contact with the probe;

an actuator for moving the sampling platform between at least an extended

position in which a soil sample is collected and a retracted position

in which the soil sample is in contact with the probe; and

one or more nozzles coupled to the tank of liquid for cleaning the probe

between measurements by directing liquid onto the probe; and

a computer telemetrically connected to the pH sensor for collecting and storing

data points.

A1
cont

34) The apparatus of claim 3, further comprising: a first sensor for detecting a location of the apparatus, the first sensor being telemetrically connected to the computer, such that the computer records pH data in the form of data points comprising a pH value of a soil sample and a location of the apparatus when the soil sample was taken.

A1

4) The apparatus of claim 3, wherein the first sensor is a GPS antenna.

5) The apparatus of claim 3, wherein the computer calculates a place from which the soil sample was taken by modifying the location of the apparatus to account for a distance between a position of the sampling platform on the chassis from the location at which the first sensor detects the apparatus.

67) The apparatus of claim 6, further comprising: at least two probe assemblies and at least two shanks, wherein the probe assemblies and shanks are slideably mounted to the chassis to permit at least a transverse distance, relative to a direction of the apparatus' motion, between the probe assemblies and shanks to be adjusted, thereby permitting a sampling density to be varied by adjusting places from which soil samples are collected relative to each other.

78) The apparatus of claim 6, further comprising at least a second sensor for detecting a position of the at least one probe assembly relative to a location of the first sensor, the second sensor being telemetrically connected to the computer, such that the computer adjusts the place recorded for each data point to account for the position of each probe assembly relative to the location detected by the first sensor.

88) The apparatus of claim 6, further comprising at least two probe assemblies and at least two shanks, wherein the probe assemblies and shanks are respectively mounted one behind another relative to a direction of motion of the apparatus when the apparatus is collecting data points, the shanks having depths that are successively deeper from front to rear, to permit measurement of pH at a plurality of depths in a single pass of the apparatus.

99) The apparatus of claim 6, in which a distance between the succeeding probe assemblies is adjustable, so that the distance can be set to an integral multiple of a space between the data points taken by a single probe assembly at a predetermined speed of the

apparatus, whereby deeper pH measurements can be made at a substantially same place as that at which shallower measurements were made.

- 10 ~~10~~ 9 The apparatus of claim 10, further comprising a second sensor for detecting a position of each probe assembly relative to a location of the first sensor, the second sensor being telemetrically connected to the computer, wherein the computer automatically adjusts the place recorded for each data point to account for the position of each probe assembly relative to the first sensor.

- 11 ~~11~~ 2) A method for measuring a pH of soil at a plurality of places throughout a field, comprising:

providing an apparatus comprising:

a chassis, comprising:

at least one shank extending from the chassis for exposing the soil

at a desired sampling depth;

a pH sensor affixed to the chassis;

at least one probe assembly affixed to the chassis, each of the at least one

probe assembly comprising:

a probe telemetrically connected to the pH sensor;

a sampling platform for collecting soil from pre-selected soil

depths and bringing it into contact with the probe; and

a computer telemetrically connected to the pH sensor for collecting and

storing data points;

selecting at least one depth at which soil pH measurements will be made and
adjusting the apparatus to cause at least one shank to expose the soil at the
selected depth or depths;
selecting a speed corresponding to a desired distance between places for pH
measurements; and
moving the chassis through the field at the selected speed to collect data for a
number of places throughout it.

A method for creating a relatively high resolution pH map for a field, comprising:
providing an apparatus comprising:

a chassis having at least one shank extending therefrom for exposing the
soil at a desired sampling depth;
a pH sensor affixed to the chassis;
at least one probe assembly affixed to the chassis, each of the at least one
probe assembly comprising:
a probe telemetrically connected to the pH sensor;
a sampling platform for collecting soil from pre-selected soil depths and
bringing it into contact with the probe; and
a computer telemetrically connected to the pH sensor for collecting and
storing data points.

selecting at least one depth at which soil pH measurements will be made;
adjusting the apparatus to cause the at least one shank to expose the soil at the
selected at least one depth;